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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/944,508	08/30/2001	Warren M. Farnworth	3393.6US (97-324.6)	4342
24247	7590	02/27/2004	EXAMINER	
TRASK BRITT			FULLER, ERIC B	
P.O. BOX 2550			ART UNIT	PAPER NUMBER
SALT LAKE CITY, UT 84110			1762	

DATE MAILED: 02/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/944,508

Applicant(s)

FARNWORTH, WARREN M.

Examiner

Eric B Fuller

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 10, 2003 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 and 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watts, Jr. et al. (US 6,276,589 B1).

Watts teaches a process where a continuous stream of charged solder droplets is produced (column 3, lines 40-45). Heaters are used to melt the solder in the reserve and maintain it in the liquid state while being ejected (column 3, lines 55-65). A piezoelectric crystal vibrator is used to induce a standing pressure wave on the solder,

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thus producing droplets (column 3, lines 50-55). When ejected, a charge is selectively applied to the solder droplets (column 4, lines 10-12). A variable bias is used to deflect some of the droplets in a certain dimension and onto a substrate (column 4, lines 15-30, column 7, lines 1-7). Additionally, some of the droplets are prevented from reaching the substrate as they are passed undeflected into a gutter. The deflection is programmably controlled (column 4, lines 13-34).

As to claim 1, the reference fails to teach that the deflection occurs in a first and second dimension. However, it is taught in figure 1 that a pair of deflection plates (16,18), situated to be perpendicular to the Y-axis, is used to deflect the solder in the Y direction while the substrate is moved in the X direction. One of ordinary skill in the art would recognize, from the teachings of Watt, that the addition of two more deflections plates, that are perpendicular to the X-axis, would allow one to deflect the solder droplets in the X direction as well. This is merely a duplication of parts. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to deflect the solder of Watts in two dimensions as opposed to only one. By doing so, the need for substrate movement may be eliminated, resulting in less energy requirements, and/or the droplet placement is more easily and accurately controlled. Additionally, more areas of the substrate are able to receive solder (as has been discussed in prior office actions).

As to claim 2, it is the position of the examiner that the heaters that heat the solder in the supply chamber act to control the temperature of the solder.

As to claim 6, since both the present invention and the reference teach using the apparatus for ejecting solder droplets onto a printed circuit board, and the method of producing the droplets that is taught by the reference is the same as that of the applicant's claim, it is the position of the examiner that the diameter of the solder droplets of the reference would be inclusive of the range that is claimed by the applicant.

As to claim 7, the reference teaches that the desired pattern determines if the droplets are caught by the gutter (blanked) or are allowed to reach the substrate (column 7, lines 40-50). Figure 1 shows horizontal lines being produced, wherein the absence of solder between the endpoint of the previous horizontal line and the starting point of the next horizontal line shows that it is not desirable to have solder between these two points. Therefore, it would have been obvious to one skilled in the art to blank the solder stream when the stream is positioned between these two points.

As to claim 8, examiner admits that Watts teaches that it is the undeflected droplets that are blanked. However, it is the examiner's position that to allow the droplets to fall undeflected into a gutter that is positioned directly under the stream or to deflect the stream into a gutter that is positioned slightly away from directly under the stream are functionally equivalent to each other, as both act to prevent solder from reaching the substrate. To use either method would have been obvious at the time the invention was made to a person having ordinary skill in the art with a reasonable expectation of success.

Claims 1-3 and 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watts, Jr. et al. (US 6,276,589 B1) in view of Metz (US 3,641,588).

Watts explicitly teaches the limitations discussed, but fails to explicitly disclose deflection in two dimensions. However, one skilled in the art would recognize that since it is the undeflected particles being blanked, the process suffers in that solder is unable to reach areas of the substrate located directly beneath the nozzle (as the gutter lies directly under the nozzle).

Metz teaches an electrostatic printer in which parallel electrodes deflect charged particles in order to deposit them in predetermined locations on a substrate. The process makes up for the deficiency of Watts by providing the gutter used for blanking in a location that requires deflection of the droplets in a separate axis in order to be reached (abstract; column 2, lines 51-75). Particles that are not deflected in this separate axis are allowed to reach the substrate in a location determined by the electrodes controlling the X-axis. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize the deflection means of Metz (including the off-centered gutter) in the process taught by Watts. By doing so, one would reap the benefits of more areas of the substrate being able to receive solder.

Claims 1-3 and 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watts, Jr. et al. (US 6,276,589 B1) in view of Doran et al. (US 5,585,629).

Watts explicitly teaches the limitations discussed, but fails to explicitly disclose deflection in two dimensions. However, Doran teaches the deflection of charged

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particles in two dimensions by the deflection plates of figure 4. it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the deflection means taught by Doran in the process taught by Watts. By doing so, the need for substrate movement may be eliminated, resulting in less energy requirements, and/or the droplet placement is more easily and accurately controlled. Additionally, more areas of the substrate are able to receive solder (as has been discussed in prior office actions).

Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watts, Jr. et al. (US 6,276,589 B1), or Watts, Jr. et al. (US 6,276,589 B1) in view of Metz (US 3,641,588) or Doran et al. (US 5,585,629), as applied to claim 3 above, and further in view of Nakasu et al. (US 6,213,356 B1).

Watts teaches the limitations of claim 3, as shown above, but fails to teach that separate piezoelectric crystals generate the pressure inducing step and the vibration step. Watts does teach to use a piezoelectric crystal for the vibration step (column 3, lines 50-55). Nakasu teaches to use of a piezoelectric crystal when pressurizing a supply of solder in order to increase consistency of the droplets being ejected (column 2, lines 36-61). Therefore, to have a second piezoelectric crystal control the pressure of the supply chamber in Watts would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, the consistency of the drop formation is increased. The diameter of the drop is read upon by Watts as shown above with respect to claim 6.

Response to Arguments

Applicant argues that the claimed invention differs from Watts in that the deflection plates of Watts do not provide a "variable electrostatic potential". This is not found persuasive. Column 4, lines 13-17, explicitly reads that the deflection plates are controllably charged by a controller that controls the bias applied to the plates. Additionally, it is taught in column 7, lines 1-7, that absence or presence of the field controls the deflection. In view of these two passages, it is apparent that the electrostatic potential provided by the plates is variable. Because it has been shown that the reference does teach that the potential may be varied, the applicant's arguments with respect to the loss of x and y range is not found persuasive.

With respect to the newly added Watts in view of Metz rejection, it is explicitly taught to use a varied electrostatic potential in the plates of both dimensions (column 2, lines 51-75).

With respect to the newly added Watts in view of Doran rejection, it is explicitly taught to use a varied electrostatic potential in the plates of both dimensions (column 5, lines 1-16).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (571) 272-1420. The examiner can normally be reached on Mondays through Thursdays.

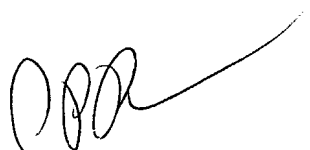
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P Beck, can be reached at (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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